naces. After melting the cobalt, iron and low-carbon ferro-chrome, the molten metal is de-oxidized with silico-calcium. Ferro-manganese and ferro-silicon are then added to obtain the required Mn and Si contents. Teeming is done at around 2910F (1600C) for UMCo-50 and 2820F (1550C) for UMCo-51.

Casting presents no particular problems. The shrinkage is of the same order as that of austenitic steels. It is worth mentioning here that UMCo-50 tubes have been successfully manufactured by centrifugal casting to minimum dimensions of 3.2 in. (80 mm) O.D. and 1.6 in. (40 mm) I.D.

The technical advantages of the UMCo alloys may be sufficient to warrant their use independently of all considerations of service life. This is the case for the discharge channel of the bloom-reheating furnace described above, where the use of UMCo-50 has resulted in eliminating the water-cooled part and has led to a considerable saving in fuel and greater regularity in operating the furnace. It is also the case for the skids fitted with insulated UMCo-50 shoes and for the beams fitted with UMCo-50 buttons found in pusher-type and walking-beam furnaces, respectively. In these two applications, use of UMCo-50 has made it possible to eliminate the dark zones on the slabs, and the associated difficulties in meeting the close tolerances often specified for rolled products.

Solidification

"Alloy Strengthening by Solidification Under Pressure," T. N. Lipchin and P. A. Bykov, *Russian Castings Production*, March, 1973, pp. 109-111.

Laboratory studies were conducted on the strengthening effects of solidifying under pressure. A 160-ton hydraulic press was used at pressures up to 250 Kg/mm² (350 ksi) with Zn, Mg, Al, and Cu alloys, steel, and cast iron. The effects on solidification time, mechanical properties, macro- and microstructure, density, electrical resistivity, and dislocation density were studied.

All the alloys showed increases in tensile strength. Non-ferrous alloys were solidified using pressures up to 250 Kg/mm² with resulting increases in strength of 30-90%. Steel solidified at a pressure of 10 Kg/mm² and gray iron at 5 Kg/mm² had increases in strength of 40% to 30%, respectively.

The causes of strengthening by solidification under pressure include the elimination of macro-defects, such as blowholes and pores, a major increase in dislocation density, and to a certain extent, grain refinement and the formation of more second phase (steel solidified at a pressure of 100 Kg/mm² produced a structure with 95% pearlite, compared with only 25% at atmospheric pressure).

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